951,809

# PATENT SPECIFICATION 951,809

DRAWINGS ATTACHED.

*Date of Application and filing Complete Specification :*
*June 19, 1961.* *No. 22027/61.*

*Application made in Switzerland (No. 6990) on June 20, 1960.*

*Complete Specification Published : March 11, 1964.*



**Index at Acceptance :—F2 V(F2C, F3B, F7B).**

**International Classification :—F 06 k.**

COMPLETE SPECIFICATION.

## Float-Operated Valves for Preventing Overfilling of Liquid Containers.

We, IGEWA AG., a Swiss Body Corporate, of 16 St. Peterstrasse, Zurich, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement: —

The present invention relates to an overfilling protection device for liquid containers and particularly to liquid storage tanks with a cut off member arranged in the filler pipe which interrupts the feed of liquid to the container when a predetermined level is reached in the latter.

Such overfilling protection devices are already known. In one known construction a butterfly valve disposed in the filler pipe is operated by a float provided in the container so that on attaining the predetermined liquid level the filler tube is progressively cut off.

Progressive closure of the filler pipe is desired in order to avoid impact effects which could lead to damage to the supply tube or pipeway. At high pressures such as may be reached under certain circumstances, for example when a high filling pressure is used there is, however, the danger that the closure force transmitted by the float to the throttle valve will not be sufficient to bring it into the closed position against the action of the filling pressure or to hold it in that position. It has indeed been proposed to effect the transmission of the closure force from the float by means of a conversion mechanism such as a servo motor or transmission mechanism providing a mechanical advantage, but in this case there is no guarantee that the throttle valve will be reliably closed. Moreover, for constructional reasons of the liquid container limits are set to the movement and size of the float.

[*Price 4s. 6d.*]

The present invention has for its object the provision of an overfilling protection device which avoids the aforesaid disadvantages and which comes into operation when a predetermined liquid level is reached in the tank even at high pressures. The overfilling protection device according to the invention, includes a filling pipe which embodies a butterfly valve pivoted to the filler pipe and is operable by a float provided in the liquid container according to the variation of the level in the liquid container and it is characterised in that the pivot axis of the butterfly valve is slightly offset from the axis of the filler pipe and that during closing operation of the butterfly valve by the float the liquid pressure ruling in the filler pipe is operative as an additional closing force.

According to another embodiment it is also possible to allow a piston to act on the butterfly valve in addition to the float, which is operated as a function of the pressure difference between a point lying above the butterfly valve and a point lying beneath the butterfly valve.

On increasing constriction of the liquid flow the pressure difference rises quickly and so also the closing force acting on the butterfly valve.

One constructional example of the overfilling protection device is shown in the accompanying drawing.

The device comprises a filler pipe 1 which is intended to be fitted to a tank for heating oil and extends at its upper end through the tank cover, not shown. A butterfly or like flow controlling valve 2 is mounted in the filler tube on a spindle 3. The axis of the spindle 3 is offset to a parallel diametral plane of the tube by an amount *a*.

A lever 6 is pivotally mounted about a spindle 5 mounted in a bearing lug 4 attached to the filler pipe 1. The lever 6 carries at its

free etnd a float 7 which is located internally of the liquid tank.

A connecting link 8 is pivoted to the arm 6 and at its other end is pivotally joined to the free end of an arm 9. The arm 9 is mounted on one end of the spindle 3 projecting outside the filler pipe 1 and is connected to rotate therewith. A U-shaped member 10 is fastened to the outer wall of the filler pipe the projecting limbs 11 of which carry stop screws 12 and 13 which limit the movement of the arm 6 in the upward and downward directions. This also permits the range of movement of the butterfly valve to be adjusted, for example to 90° so that in the open position the plane of the butterfly valve lies in the direction of flow. Thereby in the completely open position no closing force is exerted on the butterfly valve.

In order that the butterfly valve can be brought to the open position despite the displacement of the axis by the amount *a* from the dimetral plane of the pipe it is non-circular in shape but in the region of the rotary axis it is relieved so that its maximum width measured in the axial direction is somewhat smaller than the length of the chord formed by the pivot axis on the inside of the pipe.

As a result of the displacement of the pivot axis by the amount *a* from the midplane of the pipe the surface area 2*a* of the butterfly valve 2 is greater than the surface area 2*b*. If now the float 7 is raised towards the predetermined level as a result of the rise in the liquid level the butterfly valve 2 is moved in the counter-clockwise direction through the arm 6, the connecting link 8, the arm 9 and the spindle 3 in order to restrict the flow of liquid progressively and finally to cut it off, so that the surface areas 2*a* and 2*b* are acted upon more and more by the liquid. According to the degree of movement of the butterfly valve there arises a difference between the forces acting on the surface areas 2*a*, 2*b*, of which the former acts in the closing direction and the second acts in the opening direction. Since as a result of the greater surface area 2*a* the force acting thereon predominates, there is obtained from this difference a tendency for the butterfly valve to close itself which has a stabilising influence on the closing movement. When the butterfly valve has reached the closing position shown in chain dot lines the arm 6 comes to rest on the stop screw 12 so that further rotation in the counter clockwise direction becomes impossible.

As a result of the flattened form of the butterfly valve the filler pipe which normally has a circular cross-section is not completely cut off, but the gap between the inner wall of the filler pipe and the flattened surface of the butterfly valve is so small in relation to the cross-section of the pipe that in most cases it is of no significance. In order to ensure the action of the butterfly valve described a displacement of the axis of movement by an amount of about 1—2 mm. is sufficient. Instead of constructing the butterfly valve as a circular disc flattened on two sides, it may also be elliptical. The major main axis may then be longer than the inner diameter of the filler pipe so that the butterfly valve in the closed position does not lie in a plane perpendicular to the pipe axis. Further, it comes to a stop against the inside of the pipe.

Preferably the filler pipe is provided above the butterfly valve with one or more openings which open into the tank and are controlled by spring opened pressure responsive valves, for example in the form of disc valves during filling of the tank. If, for example, the feed pressure is no longer operative as a result of any cutting off of the feed pump for the liquid on reaching the pre-determined level, the valve opens under the action of the spring and permits the liquid column above the closed throttle valve to flow automatically into the tank. The valve can also act if the static pressure varies, for example because a part of the liquid in the column can pass into the tank through the closed butterfly valve.

In addition to an eccentric arrangement of the butterfly valve the arm 9 may be connected through a piston rod with a piston in a cylinder arranged for example beneath the butterfly valve and outside of the filler pipe. The cylinder can then be connected at both ends with the filler pipe by suitable pipes, i.e. above and below the butterfly valve. During filling with the liquid the piston is subjected on both sides to approximately the same pressure as long as the butterfly valve is fully open. However, when it closes slowly the pressure above it rises while that beneath it falls. Thereby the piston is dispaced in the cylinder so that it assists the closing movement of the butterfly valve.

WHAT WE CLAIM IS: —

1. Overfilling protection device for liquid containers wherein a filling pipe embodies a butterfly valve pivoted to the filler pipe and is operable by a float provided in the liquid container according to the variation of the level in the liquid container, characterised in that the pivot axis of the butterfly valve is slightly offset from the axis of the filler pipe and that during closing operation of the butterfly valve by the float the liquid pressure ruling in the filler pipe is operative as an additional closing force.

2. Overfilling protection device according to Claim 2 characterised in that the butterfly valve is formed by a flat circular disc.

3. Overfilling protection device according to Claim 2 characterised in that the butterfly

valve is of elliptical form wherein the major main axis is larger than the diameter of the filler pipe.

4. Overfilling protection device according to Claim 1 characterised in that a piston operates on the butterfly valve, one piston surface of which at least is subjected to the liquid pressure operative above the butterfly valve.

5. Overfilling protection device according to Claim 5 characterised in that the piston is subjected on its other side to the liquid pressure operative beneath the butterfly valve.

6. Overfilling protection device according to Claim 1 characterised in that pressure responsive valves are provided above the butterfly valve which connect the filler pipe with the tank when the liquid pressure falls below a given value.

7. An overfilling protection device for liquid storage vessels substantially as herein described and illustrated.

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Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1964.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2,
from which copies may be obtained.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*